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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/712,326

11/12/2003

Rao Annapragada

LAM-P-1031

2008

7590

10/15/2004

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EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 10/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/712,326

Applicant(s)

ANNAPRAGADA ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Oath/Declaration

Oath/Declaration filed on 11/12/03 has been considered.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Chooi et al. (U.S. Patent No. 6,465,888).

Referring to figures, Han et al. teaches a method of removing a photoresist layer (see col. 7, lines 59-60) form an integrated circuit (IC) structure having an etched dielectric layer with an

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exposed barrier layer, wherein the dielectric layer comprises silicon and oxygen (230, see col. 7, lines 47-54) and the barrier layer comprises silicon nitride or silicon carbide (215, see col. 7, lines 20-33), the method comprising:

Feeding a first gas mixture into a reactor wherein the first gas mixture comprises carbon monoxide (CO)(see col. 8, lines 1-10);

Generating a plasma in the reactor (see col. 8, lines 1-10, noted that gas have to flow in the chamber and plasmanizing); and

Selectively removing the photoresist layer with little or no etching of the exposed barrier layer (see figure 2b, col. 8, lines 11-16).

Regarding to claim 2, dielectric material is silicon dioxide (230, see col. 7, lines 47-54).

Regarding to claim 3, the first gas mixture further comprises oxygen (O₂) (see col. 8, lines 1-10).

Regarding to claim 4, the first gas mixture further comprises nitrogen (N₂) (see col. 8, lines 1-10).

Regarding to claims 5, 11, 15, the first gas mixture further comprise the gas mixture selected from the group consisting of oxygen, nitrogen, nitrogen/oxygen, nitrous oxide, ammonia, nitrogen/hydrogen, and water vapor (see col. 8, lines 1-10).

Regarding to claims 6, 12, 17, etched dielectric material is composed of a material selected from the group consisting of silicon dioxide, silicon oxide, organosilicate glass, and fluorinate silicate glass (see col. 7, lines 34-54).

Regarding to claims 7, 13, 18, cap layer located between the dielectric and the photoresist, the cap layer is composed of a material selected from the group consisting of silicon

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dioxide, silicon oxynitride, silicon carbide and silicon nitride (235, silicon nitride, see col. 7, lines 54-58).

Regarding to claims 8, 14, reactor used to remove the photoresist from the IC structure is also used to etch the dielectric (see col. 8, lines 1-16).

Regarding to claim 9, a third layer that includes a conductive interconnect (210) that abuts the barrier layer (215) and the second dielectric material (220) adjacent the conductive interconnect, the barrier (215) between the etched first dielectric layer (230) and the third layer (210).

Regarding to claims 10, 16, 19, the first dielectric layer (230) and the second dielectric layer (220) is comprised of materials that include silicon and oxygen (see col. 7, lines 34-54, noted that silicon oxide includes silicon and oxygen).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Han et al. (U.S. Patent No. 6,352,921) in view of Chooi et al. (U.S. Patent No. 6,465,888).

Referring to figures, Han et al. teaches a method of removing a photoresist layer (240) from an integrated circuit (IC) structure having an etched dielectric layer with an exposed barrier

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layer, wherein the dielectric layer comprises silicon and oxygen (230) and the barrier layer (215), the method comprising:

Feeding a first gas mixture into a reactor wherein the first gas mixture comprises carbon monoxide (CO)(see col. 7, lines 24-36);

Generating a plasma in the reactor (see col. 7, lines 25-36); and

Selectively removing the photoresist layer with little or no etching of the exposed barrier layer (see figure 2C, col. 7, lines 37-40).

Regarding to claim 2, dielectric material is silicon dioxide (see col. 6, lines 54-65).

Regarding to claim 3, the first gas mixture further comprises oxygen (O₂) (see col. 7, lines 24-36).

Regarding to claim 4, the first gas mixture further comprises nitrogen (N₂) (see col. 7, lines 24-36).

Regarding to claims 5, 11, 15, the first gas mixture further comprise the gas mixture selected from the group consisting of oxygen, nitrogen, nitrogen/oxygen, nitrous oxide, ammonia, nitrogen/hydrogen, and water vapor (see col. 7, lines 24-36).

Regarding to claims 6, 12, 17, etched dielectric material is composed of a material selected from the group consisting of silicon dioxide, silicon oxide, organosilicate glass, and fluorinate silicate glass (see col. 6, lines 54-65).

Regarding to claims 7, 13, 18, cap layer located between the dielectric and the photoresist, the cap layer is composed of a material selected from the group consisting of silicon dioxide, silicon oxynitride, silicon carbide and silicon nitride (235, silicon nitride, see col. 7, lines 9-12).

Regarding to claims 8, 14, reactor used to remove the photoresist from the IC structure is also used to etch the dielectric (see col. 7, lines 24-41).

Regarding to claim 9, a third layer that includes a conductive interconnect (210) that abuts the barrier layer (215) and the second dielectric material (220) adjacent the conductive interconnect, the barrier (215) between the etched first dielectric layer (230) and the third layer (210).

Regarding to claims 10, 16, 19, the first dielectric layer (230) and the second dielectric layer (220) is comprised of materials that include silicon and oxygen (see col. 6, lines 54-65, noted that silicon oxide includes silicon and oxygen).

However, Han et al. does not teach the barrier layer is made of silicon carbide or silicon nitride.

Chooi et al. teaches forming a barrier layer (215, passivation layer) by using a material of silicon carbide (see col. 7, lines 31-34).

Therefore, it would have be obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form the barrier layer by using silicon carbide in process of Han et al. in process of Chooi et al. because the process would prevent the diffusion of the metal layer.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN